AKADÉMIAI KIADÓ

Protection and renewal design of vernacular architecture in Xiazhuang Village

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ABSTRACT

The focus of this study is how Xiazhuang Village with high quality resources can achieve sustainable development in the new era by protecting and transforming vernacular architecture. Based on the layout of village, the characteristics of vernacular architecture and the ecological advantages of construction technology, this study puts forward the classification renewal and optimization design based on different buildings to solve the problems of village. Try to find a way to continue the historical context of vernacular architecture and satisfy the development of rural tourism at the same time.

KEYWORDS

ecological protection, vernacular architecture, micro-renewal

1. INTRODUCTION

Vernacular architecture, as a typical material carrier of regional culture, is an eternal art form of human wisdom, necessity and collective creativity [1]. The cultural ecological protection of vernacular architecture is to protect vernacular architecture and its natural and social environment, and reduce the conflict between traditional culture, modern culture and current environment. Under the current global industrialization, effective measures should be taken to create a reasonable environment for vernacular architecture to survive and develop, so that it can better adapt to the current society and coexist harmoniously with the current development.

As an integral part of rural landscape, vernacular architecture plays an important role in rural sustainable development and rural revitalization. It carries the development of culture, records the history of mankind, and is the main material carrier of national characteristics and regionalism. Vernacular architecture is the important supporting element of sustainable rural development [2]. With the completion of the road, Xiazhuang Village welcomes a good opportunity for construction and development. Under the background of rural revitalization, the village pattern and the vernacular architecture with regional characteristics have become the dominant resources for the development of Xiazhuang Village, which are worthy of protection and renewal. The humanism of regionalism and localism is a utopia built for the future countryside [3].

1.1. Project overview

Xiazhuang Village located in Zhuxian Township, Wushan County, Chongqing and at the bottom of a huge sinkhole, surrounded by high mountains. The lowest point of the sinkhole

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is only 200 m above sea level, while the highest point of the sinkhole is 1,350 m above sea level. It's nearly vertical, 1,100 m from the edge of the pit to the bottom. Due to its unique geographical location, Xiazhuang Village is extremely remote and inaccessible, and the villagers almost live in isolation. Before 1997, the only way out of the village was by climbing a trail on the cliff. Half of the 396 villagers have never been out of the village. There are no roads that can be opened to traffic. Agricultural products in the village and materials from outside cannot be exchanged. The villagers live in poverty. In order to escape isolation and poverty, villagers began to dig roads on the cliffs. In 2004, villagers in Xiazhuang Village finally carved an eight-kilometer "sky road" through the cliff, but it cost six villager's lives. The "Heaven Road" has completely changed the village isolated and poor, brought development opportunities to Xiazhuang.

1.2. Design tasks

The spirit of Xiazhuang people building roads under the difficult conditions of lack of materials and money is well known throughout the country. President Xi Jinping highly praised Xiazhuang Villages for their "Xiazhuang spirit" [4]. The focus of the design is how Xiazhuang Village can achieve sustainable development by protecting and transforming vernacular architecture. Based on the characteristics of vernacular architecture and the ecological advantages of construction technology, this study puts forward the classification renewal and optimization design based on different buildings to solve the problems of village. Try to find a way to continue the historical context of vernacular architecture and satisfy the development of rural tourism at the same time.

2. DESIGN METHODOLOGY

2.1. Site analysis

In the field investigation, Xiazhuang Village's industrial characteristics, spatial pattern, the relationship between mountains and fields and residential areas, road distribution, the aesthetics of spatial form, and the basic situation of buildings have all become important objects of investigation. The design team summarized the current situation of Xiazhuang Village through consulting materials and field investigation as follows:

- Xiazhuang Village is fortunate to be one of the key tourist destinations in Wushan County, and Xiazhuang spirit of self-improvement experience as its tourism theme;
- Xiazhuang Village relies on the mountain next to the water, with the layout of the house terrain. It reflects Xiazhuang people's pursuit of nature and pays special attention to the maintenance of ecological environment, so that architecture and nature are integrated;
- The villagers make full use of the open space in front and back of the house and the gentle slope of the village to plant walnut, crisp plum and orange;
- The residential buildings of the village are scattered on the slope, connected by winding roads. The traditional buildings are constructed with local materials and have strong ecological suitability. Rammed earth walls keep the interior warm in winter and cool in summer, while the wide eaves and pitched roof facilitate both drainage and air circulation. There are a large number of rammed earth houses built in the 1960s in the village, and many villagers still live in them, keeping the traditional primitive way of production and life, and living a peaceful life. The house is surrounded by bamboo and trees, and the sound of birds is everywhere.

2.2. Problem statement

Xiazhuang Village has unique natural landscape resources, unique canyons and cliffs, original ecological environment and rich vegetation. These natural ecological resources and environment can effectively support the development of local rural tourism; however, the living environment is in urgent need of change:

- There is a total of 102 residential buildings in Xiazhuang Village, scattered in the gentle slope, among which 58 are traditional rammed earth buildings (civil structures), 4 are traditional brick and wood structures, and 40 are newly built brick and concrete structures. The whole village is a mess of buildings, with the lack of features on the facades, large areas of grey cement walls and rough and crude brick walls ruining the countryside (Fig. 1).
- The traditional rammed earth architecture with regional characteristics makes the countryside unique and is an important carrier for tourists to recall the traditional rural life. Some of the old buildings were so damaged that they were not usable. Although some old buildings continue to be used by people, the interior of the building is simple and lacking in functions, which cannot meet the modern life, let alone meet the tourism;
- The courtyards in front of and behind the house were occupied by all kinds of items at random, making the environment not only lack of aesthetic sense of rural living but also a representative of dirty and messy environment.

2.3. Design strategy

After a series of qualitative and quantitative analysis of Xiazhuang Village, the design team proposed to shape the rural idyllic scenery with regional characteristics by means of ecological and local construction methods. Simple local construction methods as passive strategies provide a stable comfortable environment [5]. The primary task of the design is to classify the existing buildings.

For newly built brick and concrete houses, the main renovation content is the appearance of the building. Use the comprehensive way to reduce the destruction of the building to the environmental aesthetic feeling. By adding traditional architectural components, the facade of the building is enriched to make its form more traditional characteristics.

Fig. 1. Current situation of rural architecture in Xiazhuang Village (*Source*: photo by Shi Yongting)

Architectural color and natural integration, enhance the sense of local architecture and artistic.

For traditional vernacular architecture, the adaptive renewal should be treated differently according to the specific situation. For the well-preserved architecture, the reinforcement and repair of local materials should be the main method to show the original ecological vernacular construction to a large extent. For partially damaged buildings, in addition to reinforcement and repair, glass, steel and other contemporary design elements are appropriately implanted, so that ancient building materials and ecological construction techniques collide with contemporary materials, reinforcement technology and design techniques, and fully integrate tradition and modernity. For damaged buildings, reconstruction of new Chinese style inn, the remains of the original construction decoration can serve as the ornament, to increase the places the original build memory, highlight the vernacular architecture of the "true", "ecological", "identification", and "harmony" and "adaptation" to the new part.

3. FINAL DESIGN

3.1. Ecological new vernacular architecture

It is not operable to transform 102 buildings in a short time, so it is the best way to choose the reconstruction pilot. The pilot can activate the inner power and guide the villagers to build spontaneously. The design team chose a severely damaged, unoccupied, easily accessible home with good views as a demonstration project. The original building had rammed earth walls and a wooden frame roof with tile (Fig. 2).

The pilot building will be a rural inn that could receive tourists. The concept of design and construction are as follows:

- Built on the site, retaining several rammed earth walls of the original building. Although rammed earth wall does not have the function of bearing, the accumulated traces on its surface are the carrier of historical memory and the sustenance of nostalgia. This natural material is more sustainable, ecological, reusable and locally available. It is easy to produce it and transport it from nearby surroundings, which lowers the budget and has low impact on the environment [5];
- The new building adopts steel structure as support, the recyclability of steel reduces the damage of building materials to the environment and can effectively increase the building space and enrich the building function. The building is designed for three levels, with a reception room, dining room, tea room, kitchen and two guest rooms on the ground floor. The second floor has 3 guest rooms and a viewing deck. There are three guest rooms on the third floor. The organization of each floor emphasizes the feelings and experiences of all users (Fig. 3);
- The load-bearing structure of the building is steel structure, reserved rammed earth wall are the part of the wall, the new wall is double glass and wood wall with thermal insulation function. The roof adopts slope tile roof with vernacular architectural characteristics. The selection of building materials reflects the combination of new and old, traditional and modern (Fig. 4);
- Through the design to form a high and low scattered roof, avoid large roof cover. So that the architectural appearance is more aesthetic (Fig. 5);
- The interior space design is simple and natural, emphasizing the communication with the external landscape

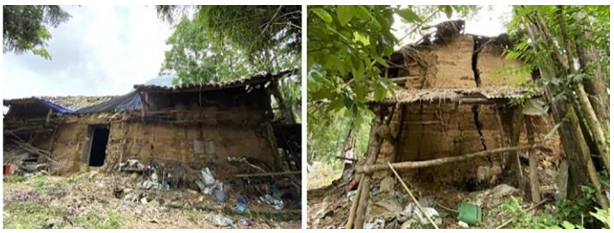

Fig. 2. Original state of pilot architecture (*Source*: photo by Shi Yongting)

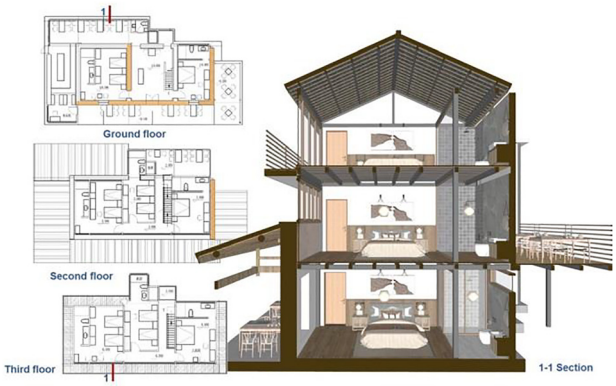

Fig. 3. Architectural design plan and section (*Source*: drawing by Shi Yongting)

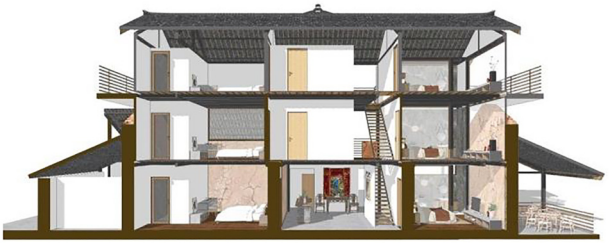

Fig. 4. Section of building (*Source*: drawing by Shi Yongting)

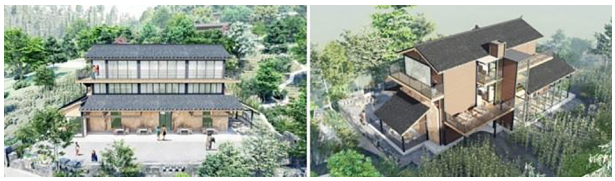

Fig. 5. Architectural renderings (*Source*: drawing by Shi Yongting)

through the large window surface, highlighting the characteristics of rural architecture integrating with nature (Fig. 6);

- Reduce the damage to the environment during construction, especially pay attention to the protection of formed trees and rammed earth walls (Fig. 7);
- The whole design and construction process focuses on ecological, low intervention and natural way to build the building into a part of the rural natural environment, while protecting the traditional residential buildings and updating their functions (Fig. 8).

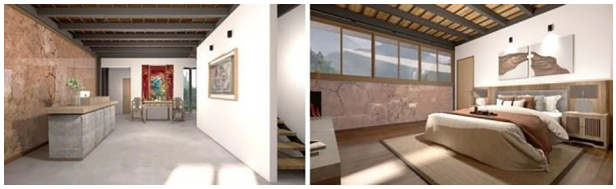

Fig. 6. Interior design (*Source*: drawing by Shi Yongting)

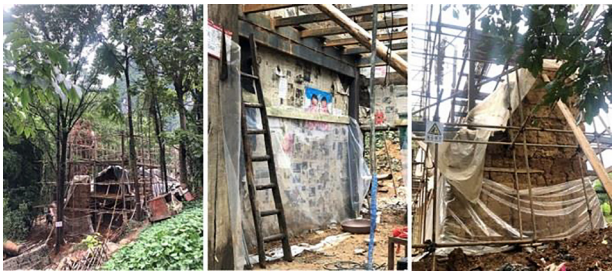

Fig. 7. Protection of trees and old wall in construction (*Source*: photo by Shi Yongting)

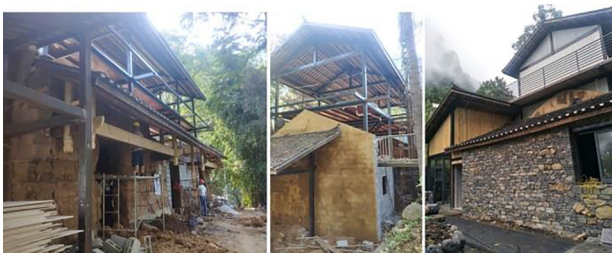

Fig. 8. New vernacular building under construction (*Source*: photo by Shi Yongting)

3.2. Micro-renewal of rural building

As it was mentioned in the previous analysis, the newly built brick houses in Xiazhuang Village have no regional characteristics, not only lack the aesthetic feeling and ecological suitability, but also the simple construction method destroys the rural style.

The simple transformation of new houses has become the focus of this study, so a newly built house is selected as a pilot to study its renewal mode. After analysis, the design team chose to transform the building with micro- renewal. 'Micro-renewal', as a new upgrading method, which is evolution from the traditional upgrading method under culture demand, emphasizes balancing the usage function and historical culture by necessary new construction, protection, demolition methods [6].

The building was originally a two-story brick house. The main building has a flat roof, while the roof of the small building on the right is simple colored steel tiles (Fig. 9).

Under the design concept of micro-renewal, the function of the building is adjusted. The first floor is for villager to live, the second floor is transformed for tourists, and the roof of

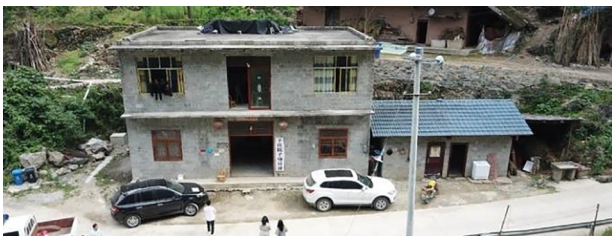

Fig. 9. Original status of building (*Source*: photo by Shi Yongting)

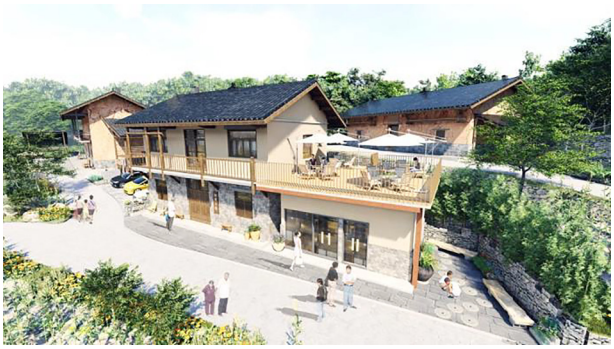

Fig. 10. Architectural renderings of the micro-renewal design (*Source*: drawing by Shi Yongting)

the cabin is transformed into a terrace for activities, so as to enhance the richness of space. The main building strengthens the balcony on the second floor and adds a wooden frame structure to strengthen the building's characteristics.

The roof of the main building has also been transformed from a flat that is not conducive to drainage to a pitched roof that is more conducive to air circulation and rain drainage, while giving the building more local characteristics. At one side of the building, the space for stacking sundries is also used to create outdoor leisure places with local and natural materials (Fig. 10).

4. CONCLUSION

Vernacular architecture, as an important part of rural landscape, needs to be protected and inherited. Inheriting vernacular architecture and reshaping vernacular characteristics are not only conducive to the development of differentiated and characteristic rural tourism, but also conducive to rural revitalization. In the process of protection and utilization, attention should be paid to ecological protection, and restoration and reuse should be carried out according to the characteristics of existing buildings. For new buildings that destroy local style, spatial functions should be optimized, building facades rebuilt, local architectural symbols and methods added, and regional architectural characteristics strengthened. For the damaged vernacular buildings, while strengthening and repairing, glass and steel can be used to expand the new functions and layout of the buildings. It makes ancient building materials and ecological building technology collide with contemporary materials, reinforcement technology and design technology, and fully integrates tradition and modernity to highlight the charm of vernacular architecture.

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